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Hill et al.

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(54) **TRAILER MOVING SYSTEM**

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B62D 59/04 (2006.01)

(52) **U.S. Cl.**
CPC ***B62D 21/20*** (2013.01); ***B62D 59/04*** (2013.01)

(58) **Field of Classification Search**
CPC B62D 21/20; B62D 59/04
USPC 280/789
See application file for complete search history.

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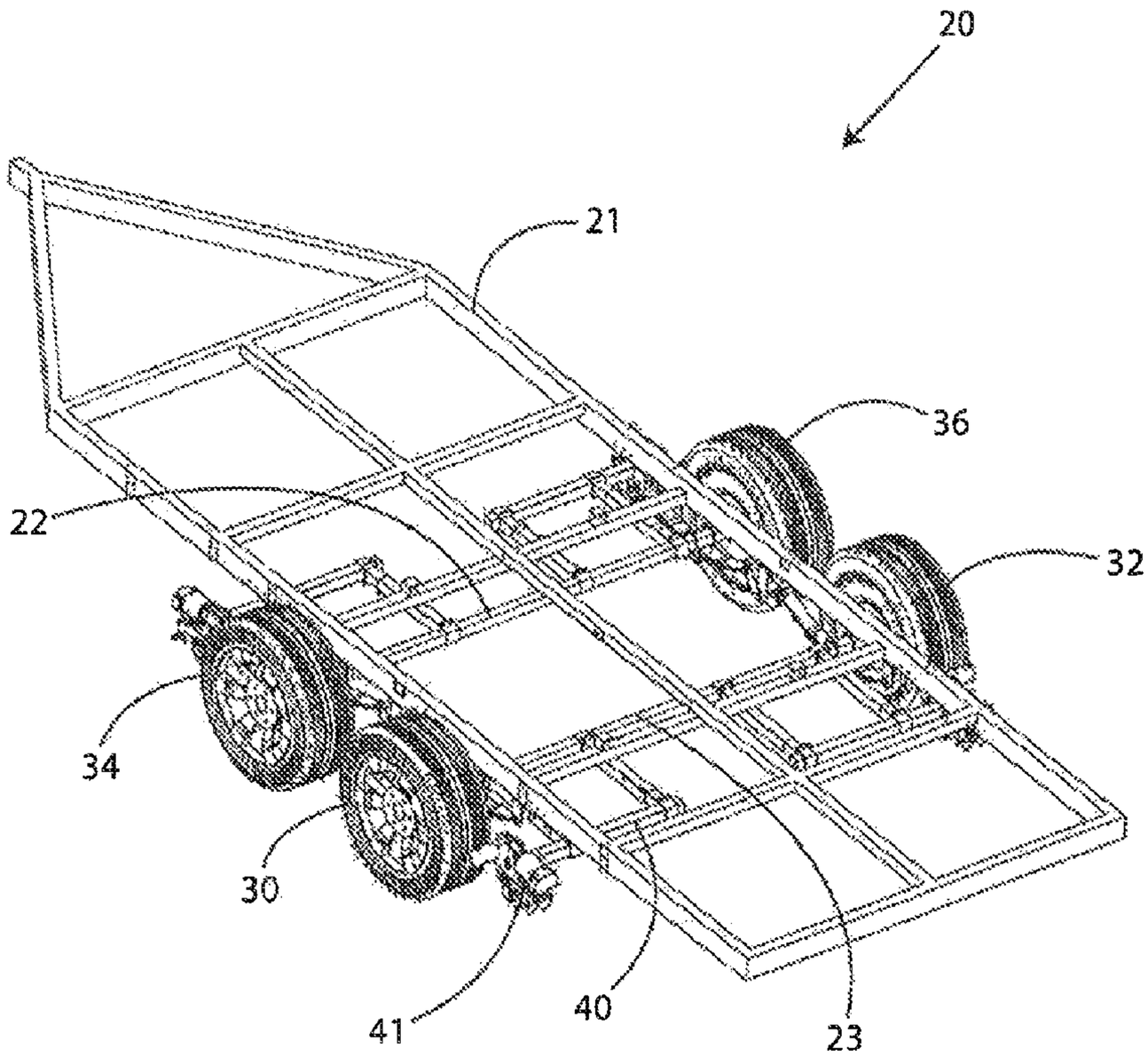
(57) **ABSTRACT**

A system for supporting a trailer mover in a fixed spatial relationship to the wheels of a trailer is provided. The system has embodiments handling both independent and non-independent suspension; movers mounted either before or aft the wheels; and, movers mounted on either left hand or right hand wheels. The system attaches to the sprung portion of the trailer suspension to provide the fixed spatial relationship. Adjustable components provide longitudinal and lateral adjustment of the position of the trailer mover to cater for different proximal wheel and suspension geometries.

15 Claims, 12 Drawing Sheets



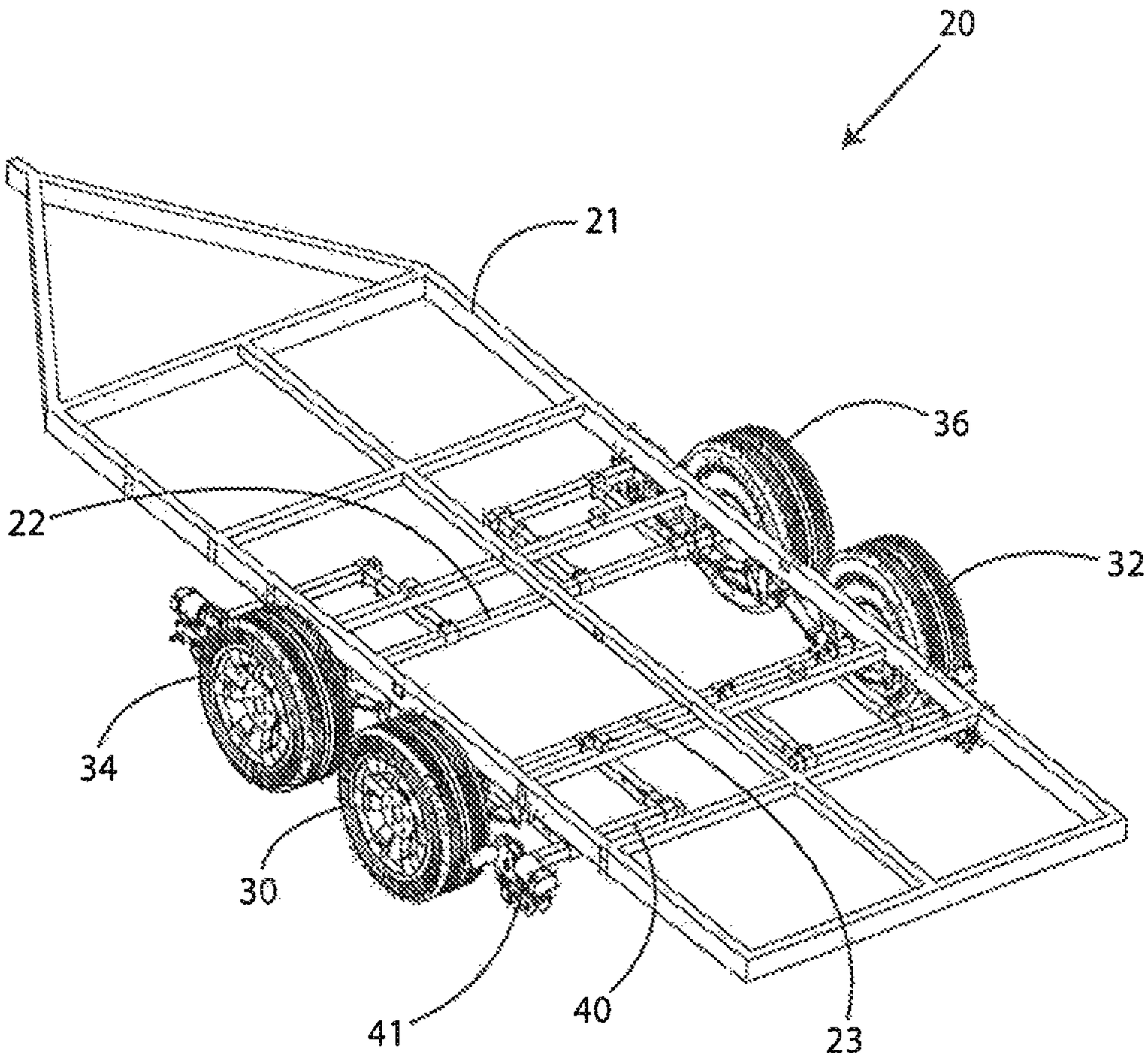


Figure 1

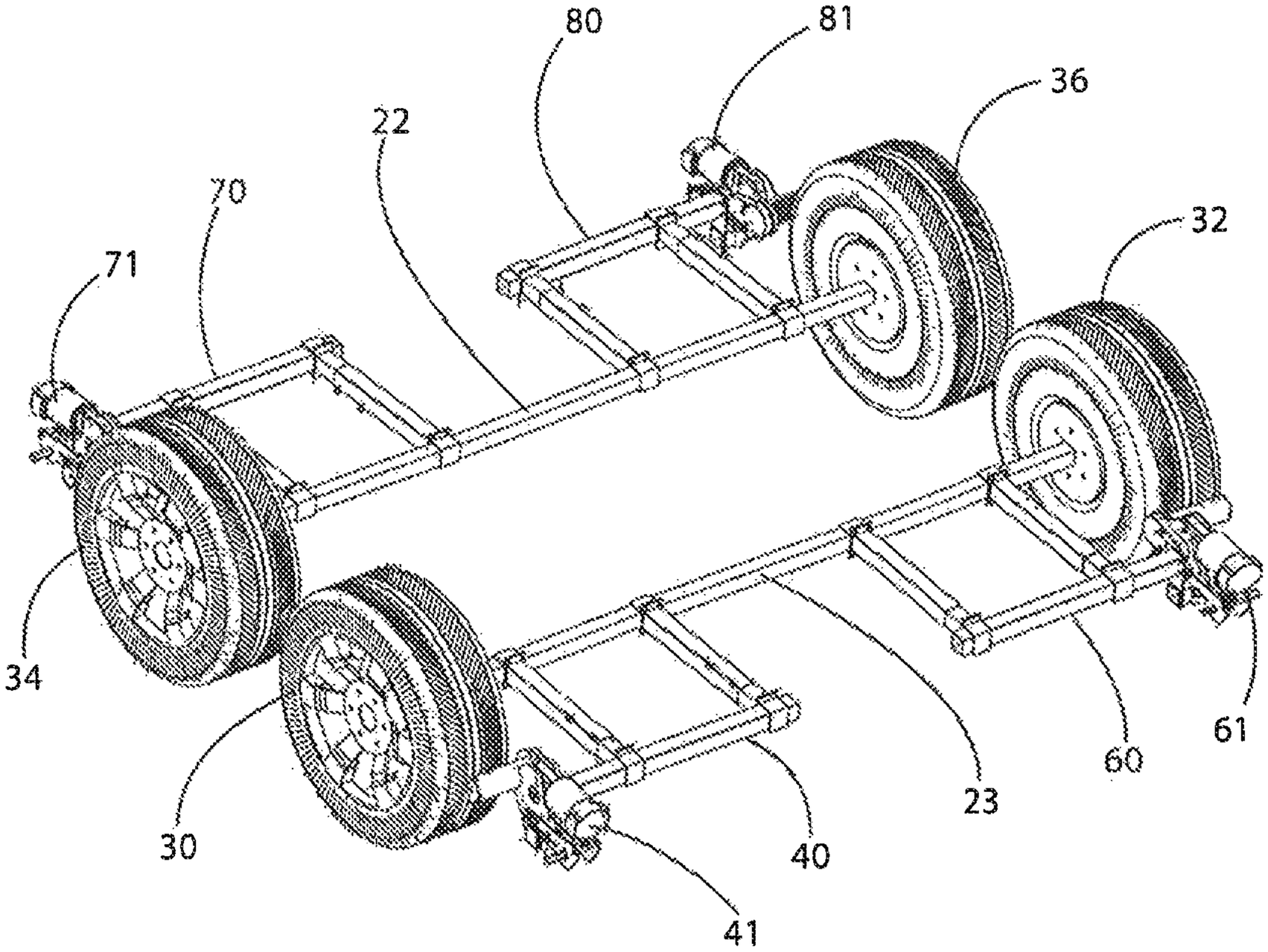


Figure 2

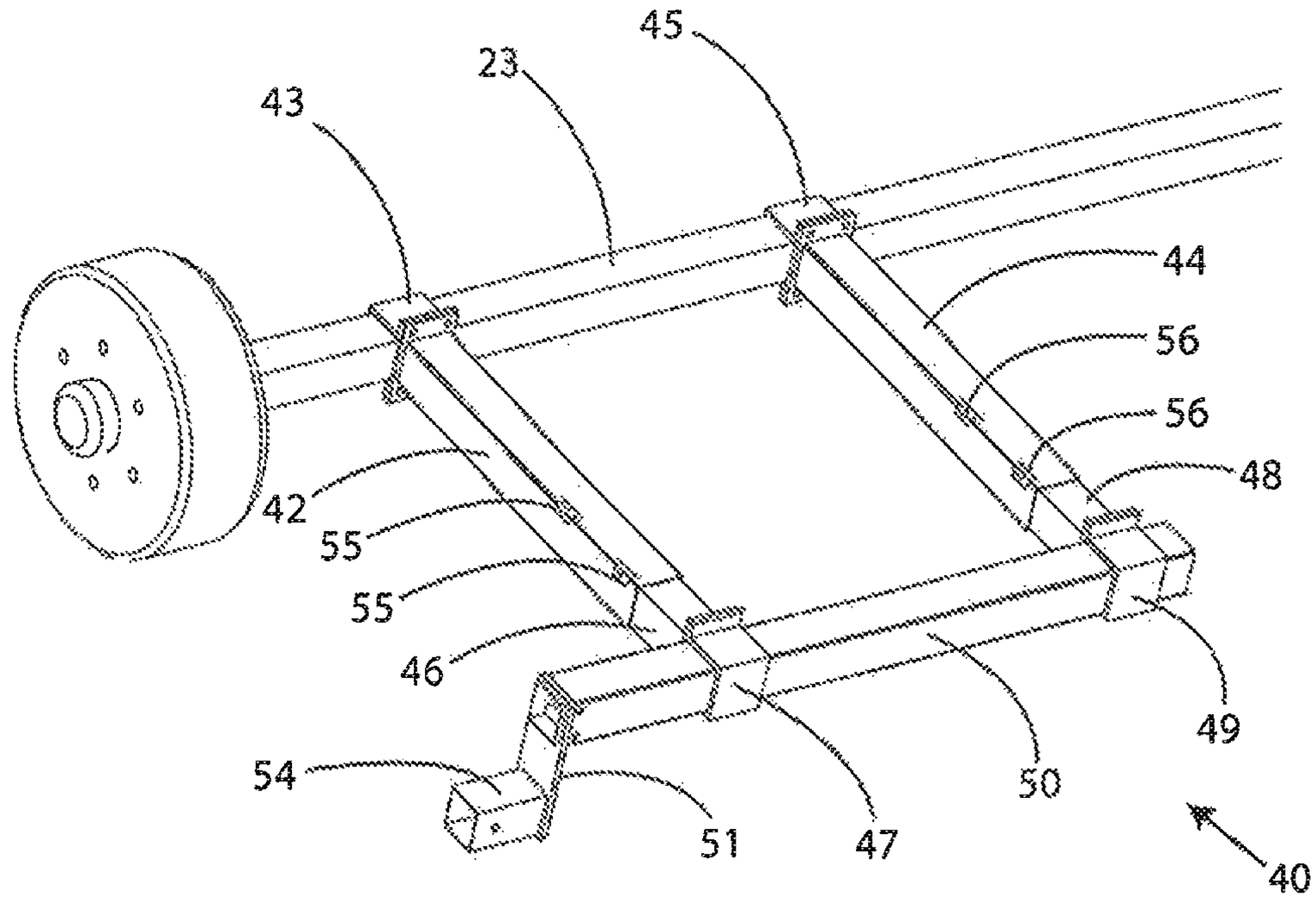


Figure 3A

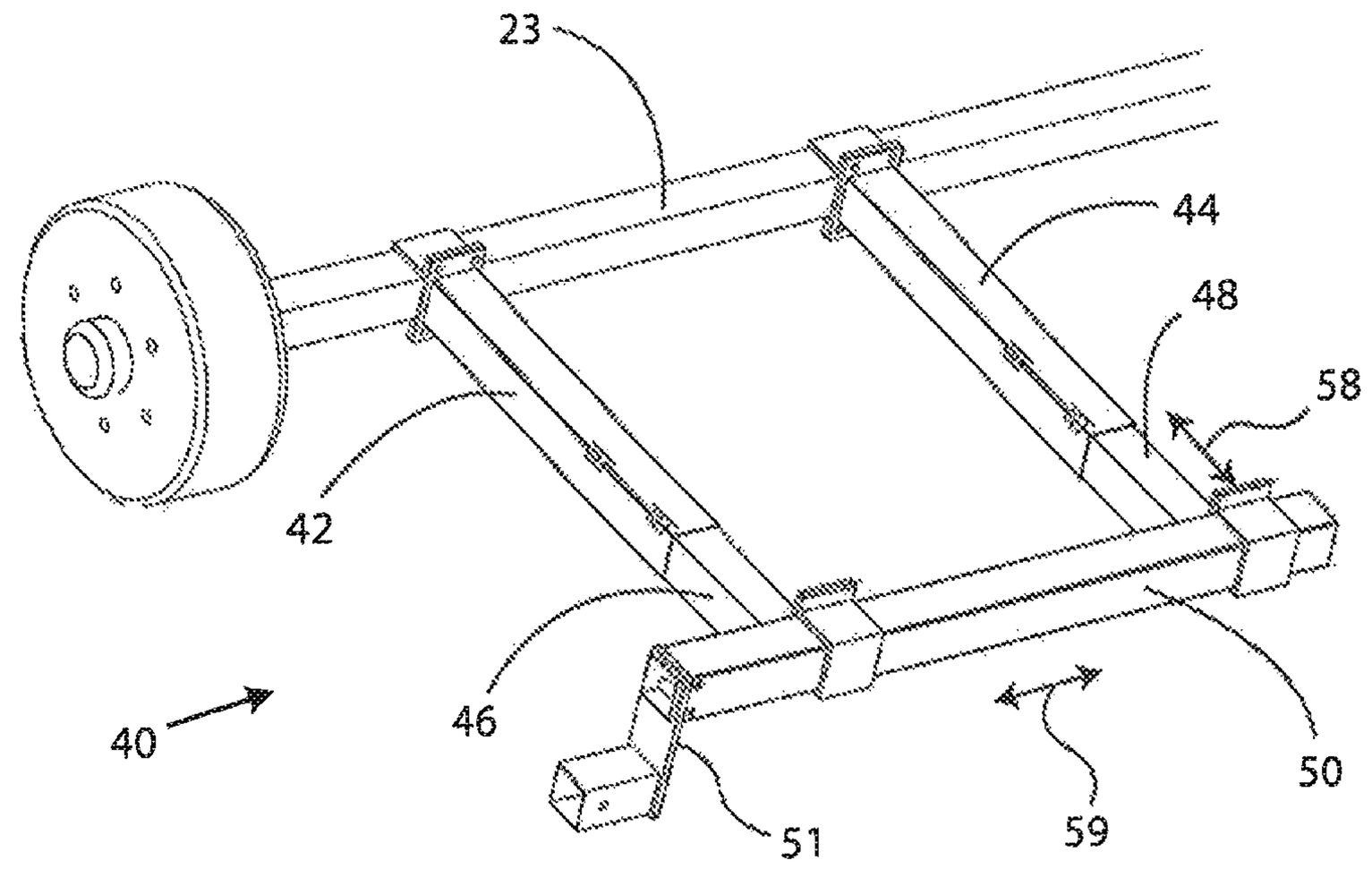


Figure 3B

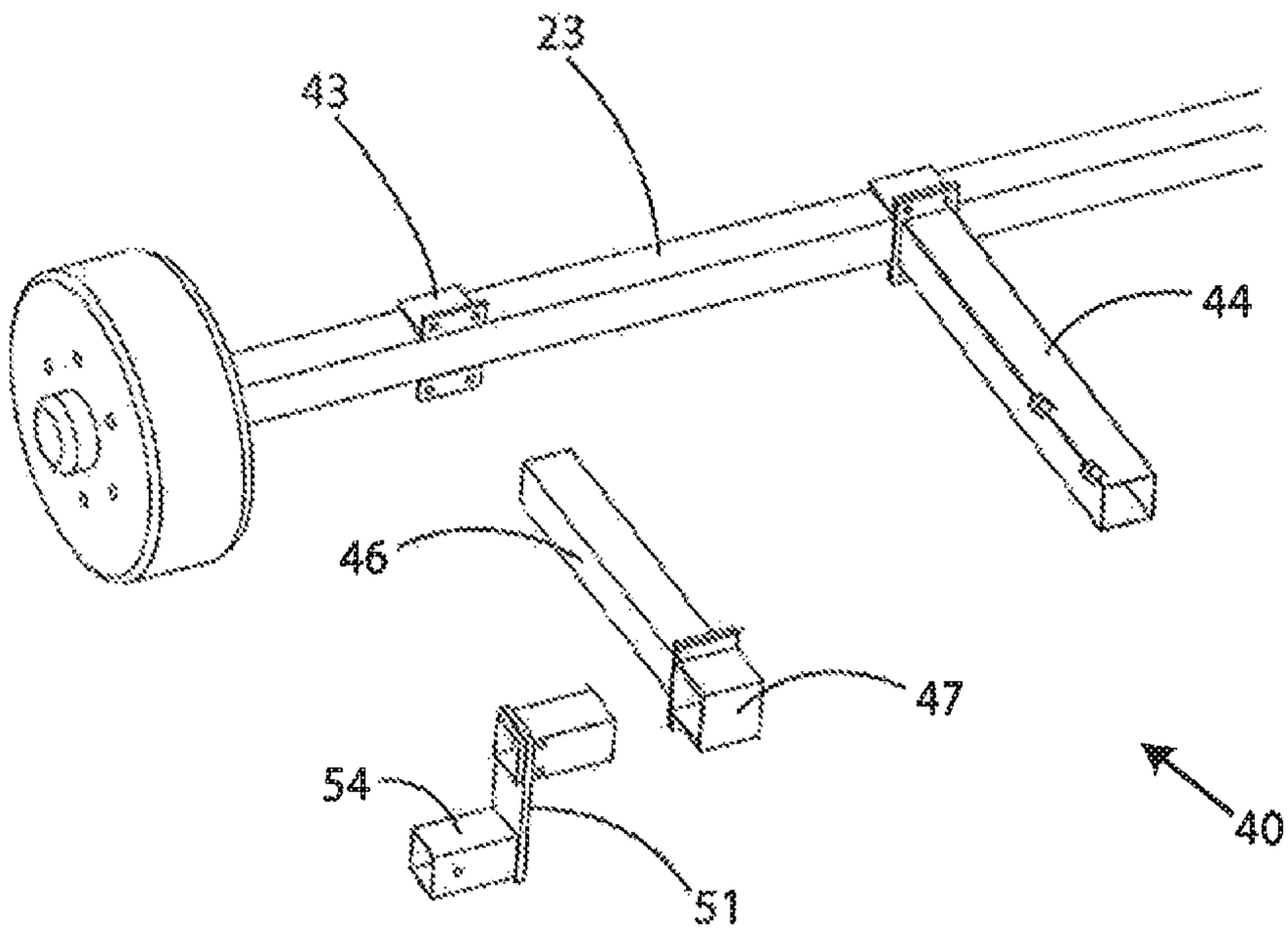


Figure 4

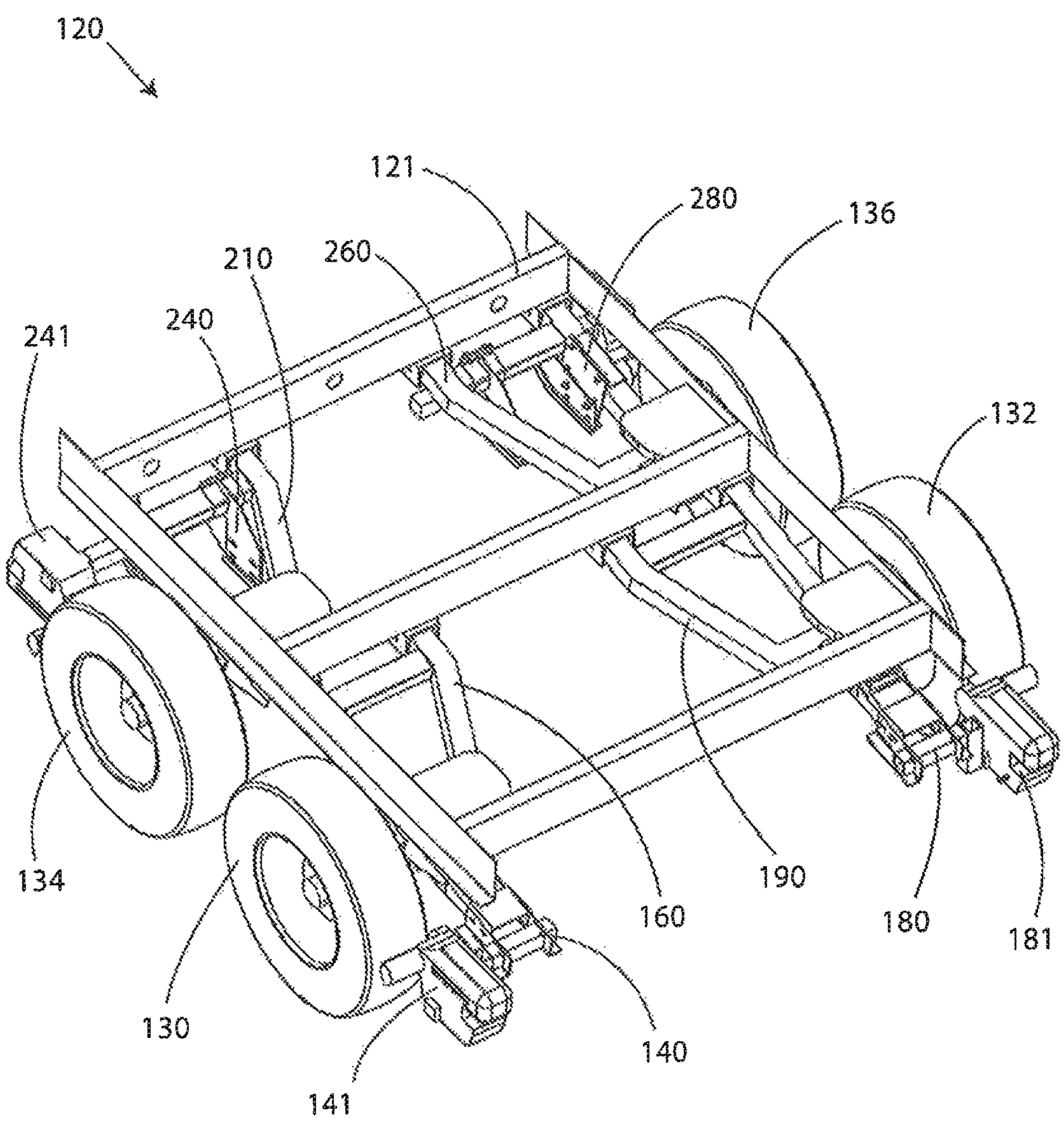

120
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Figure 5

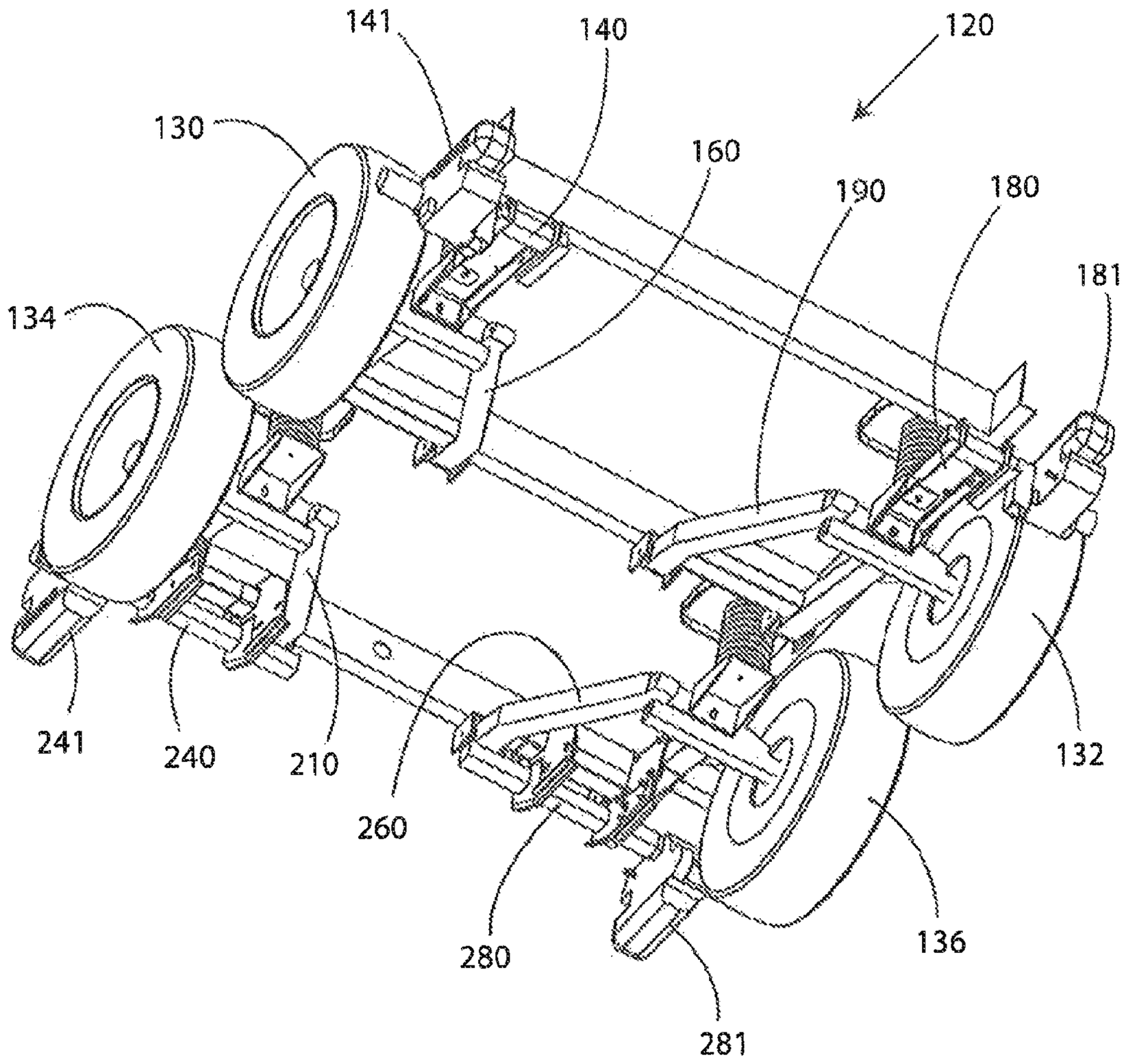
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Figure 6

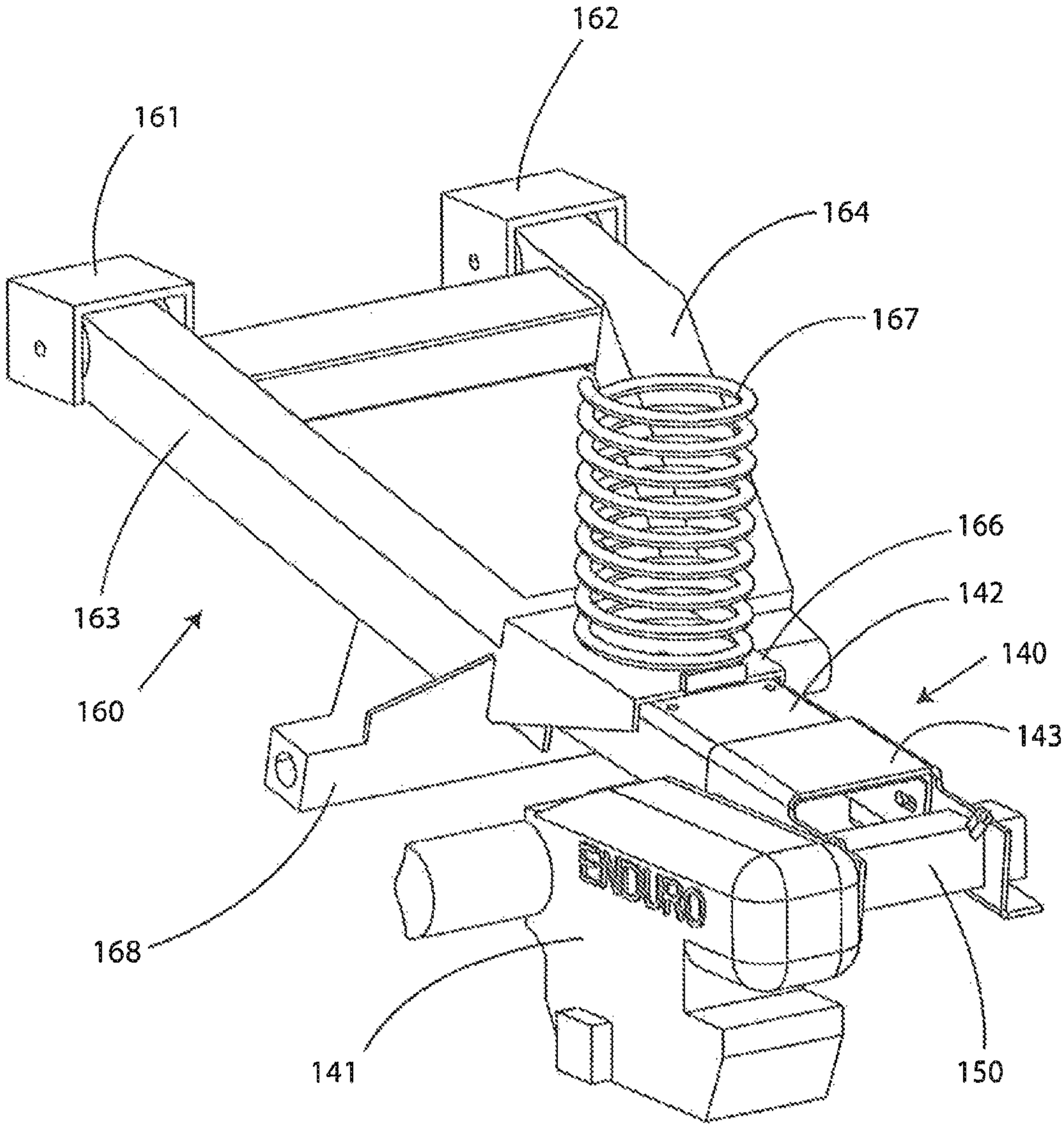

Figure 7

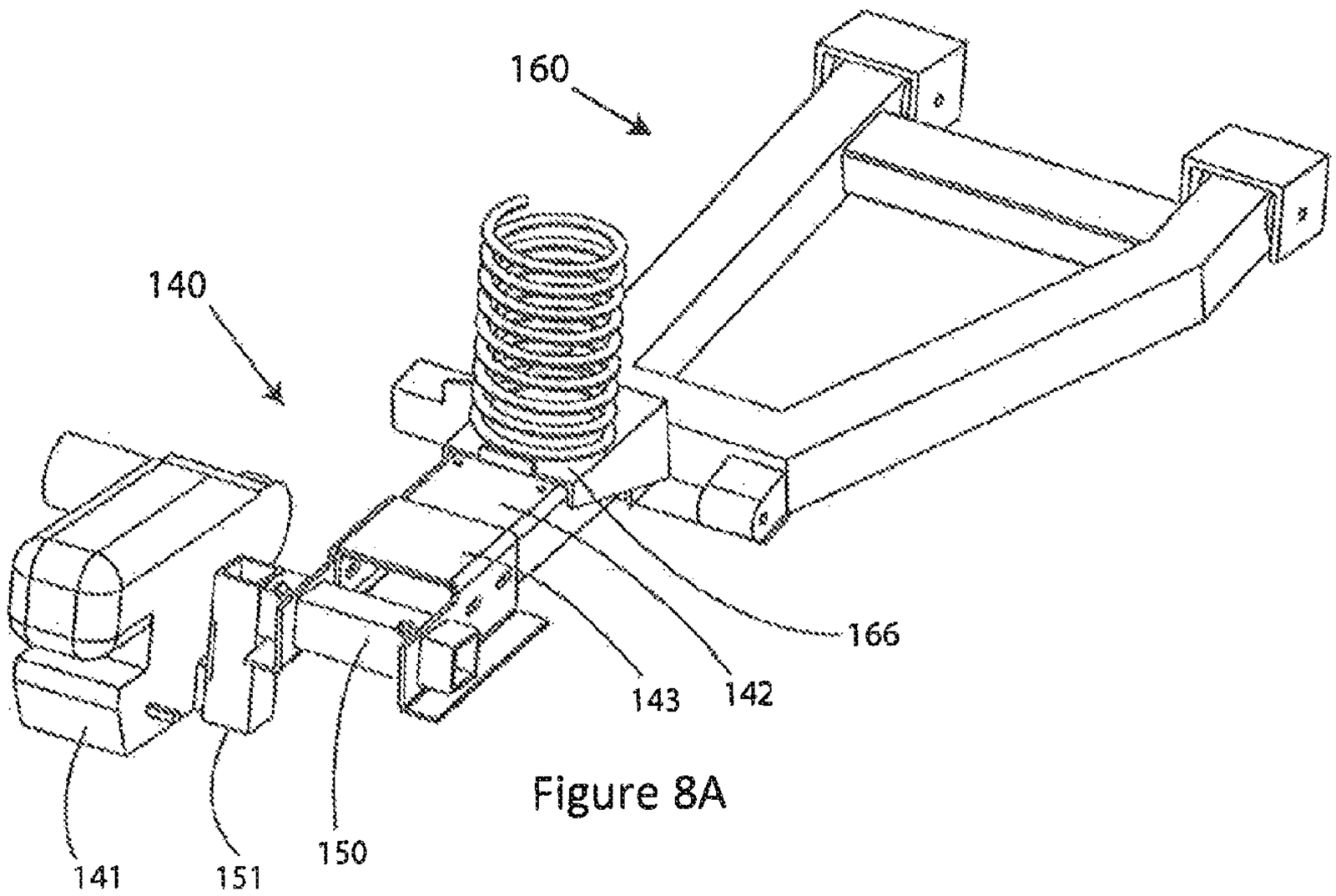

Figure 8A

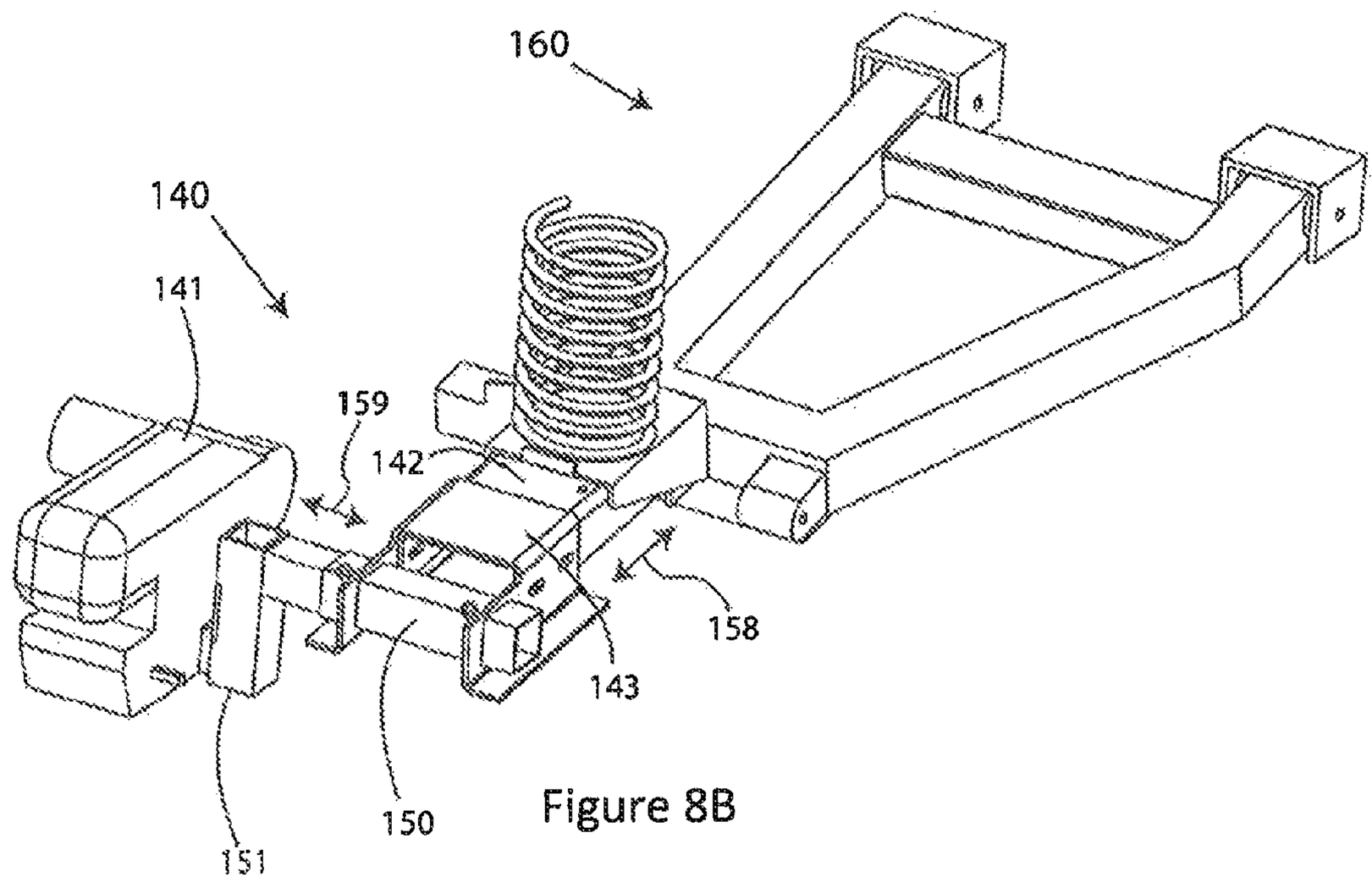

Figure 8B

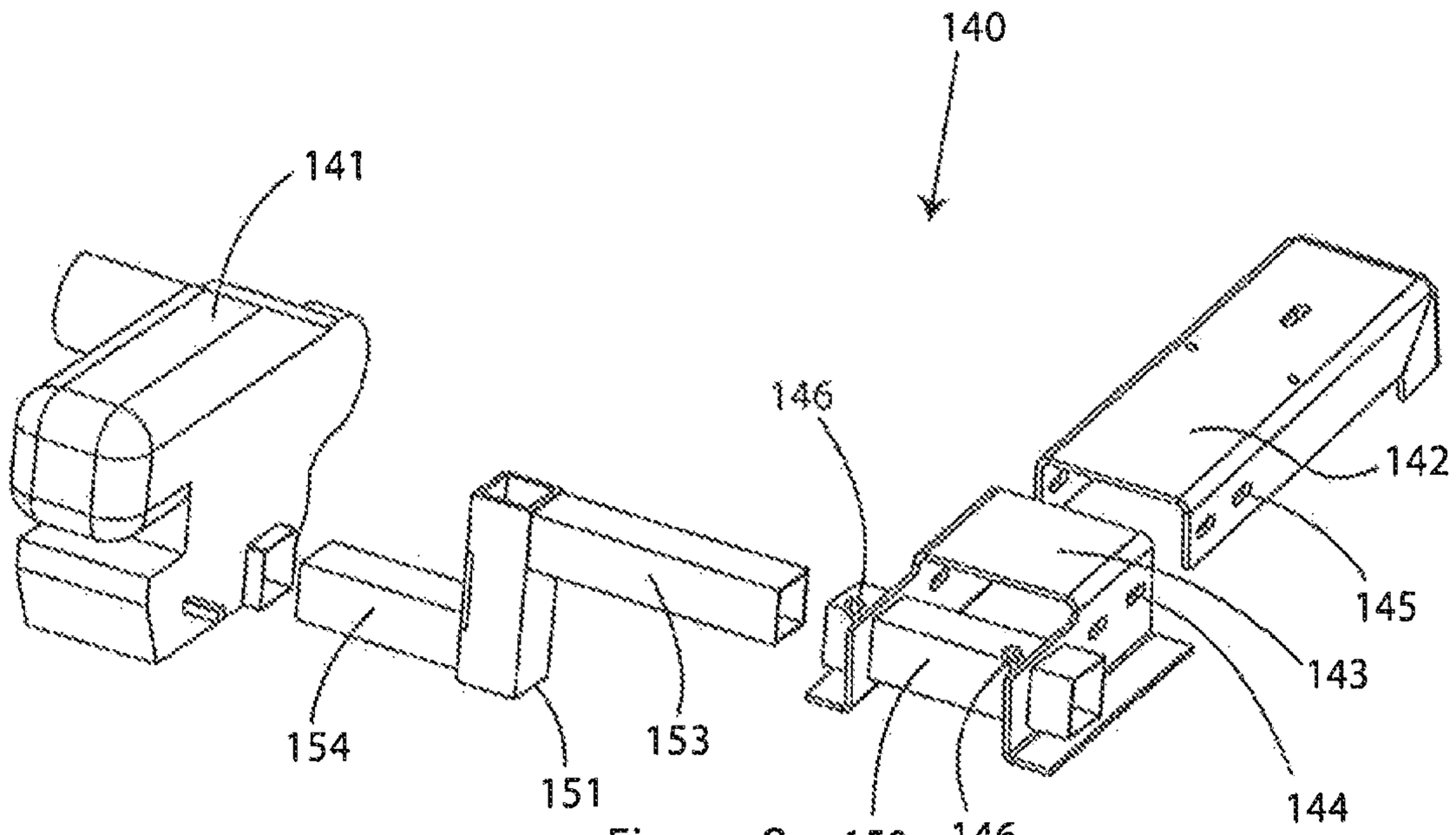

Figure 9

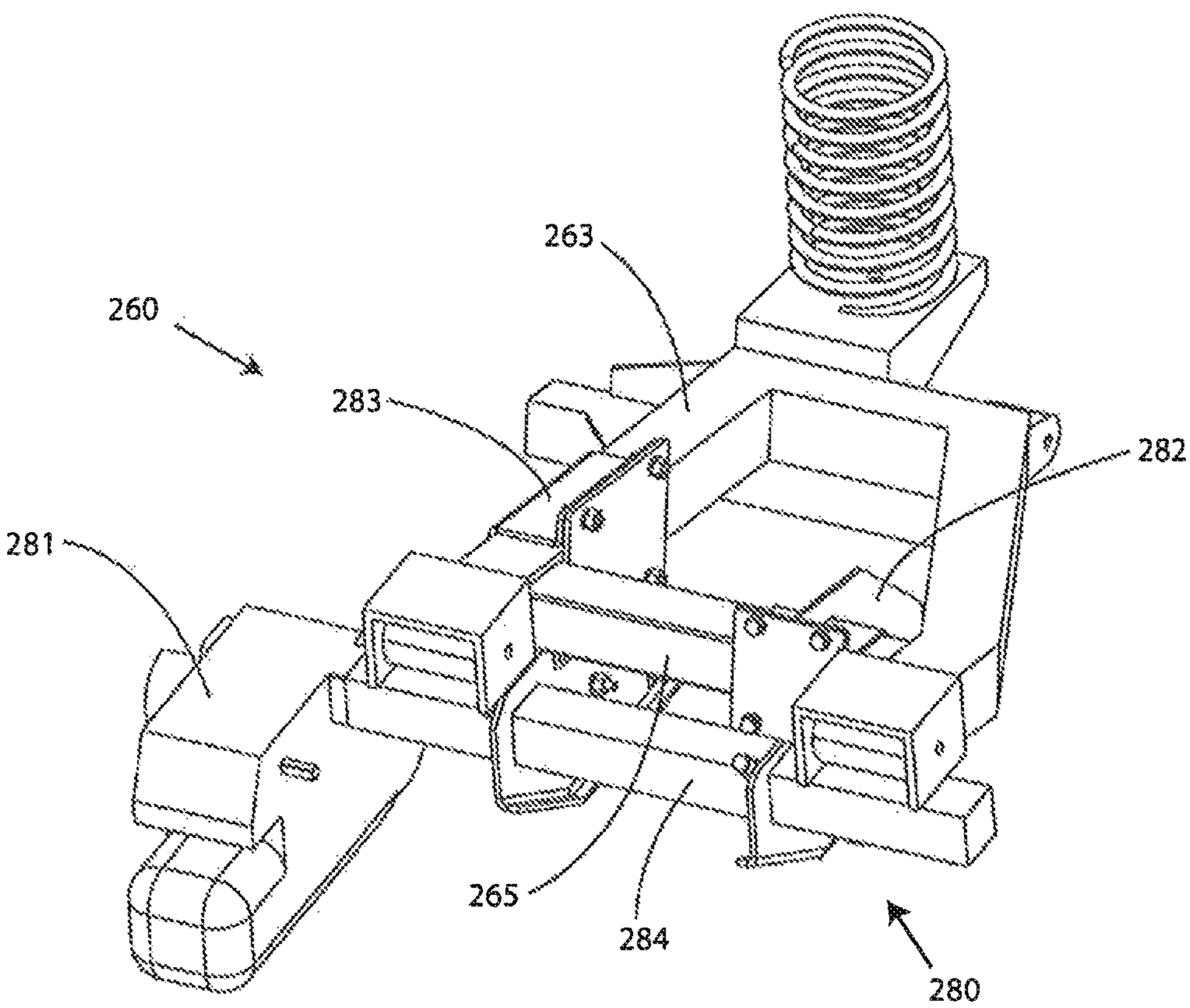

Figure 10

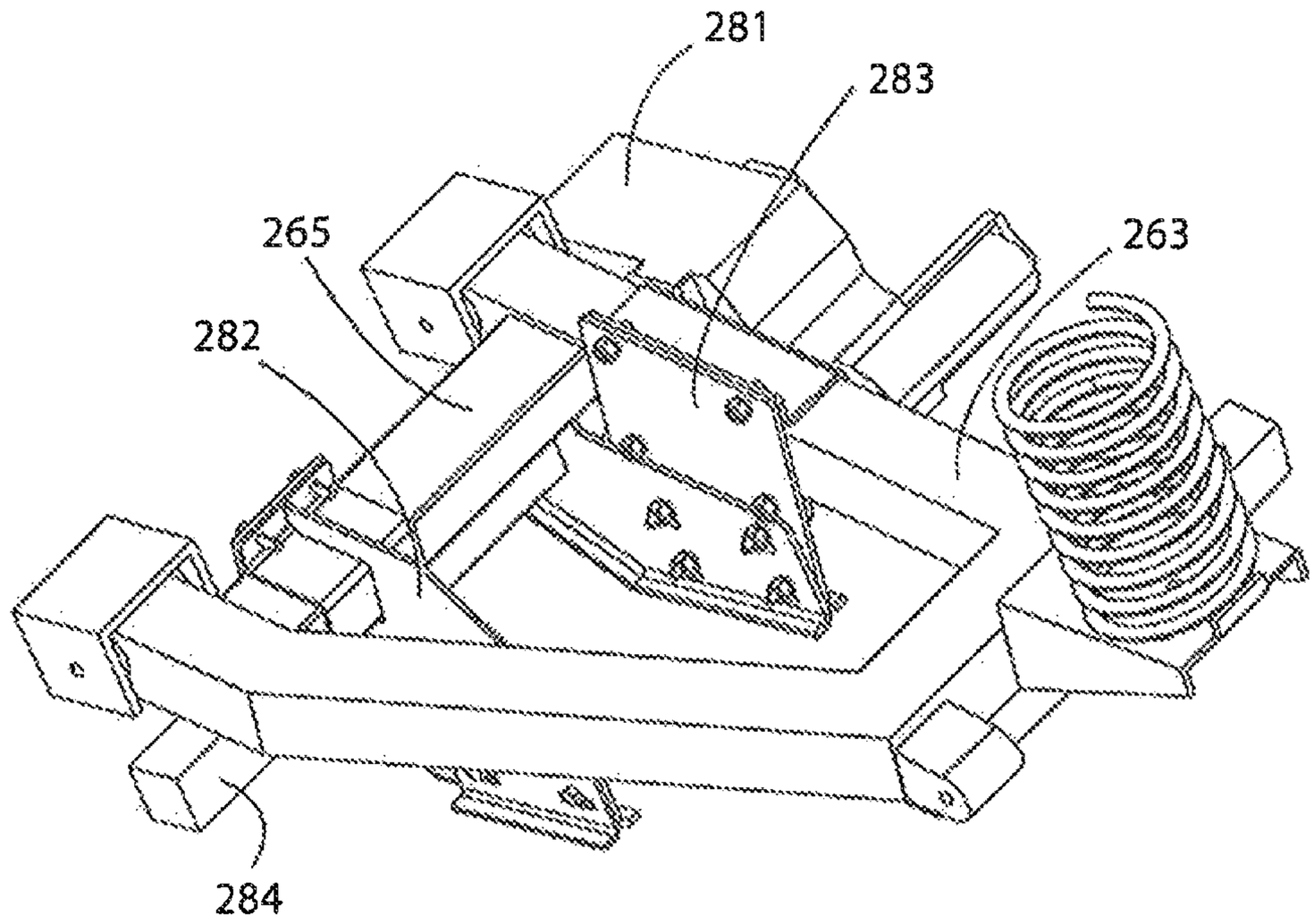

Figure 11

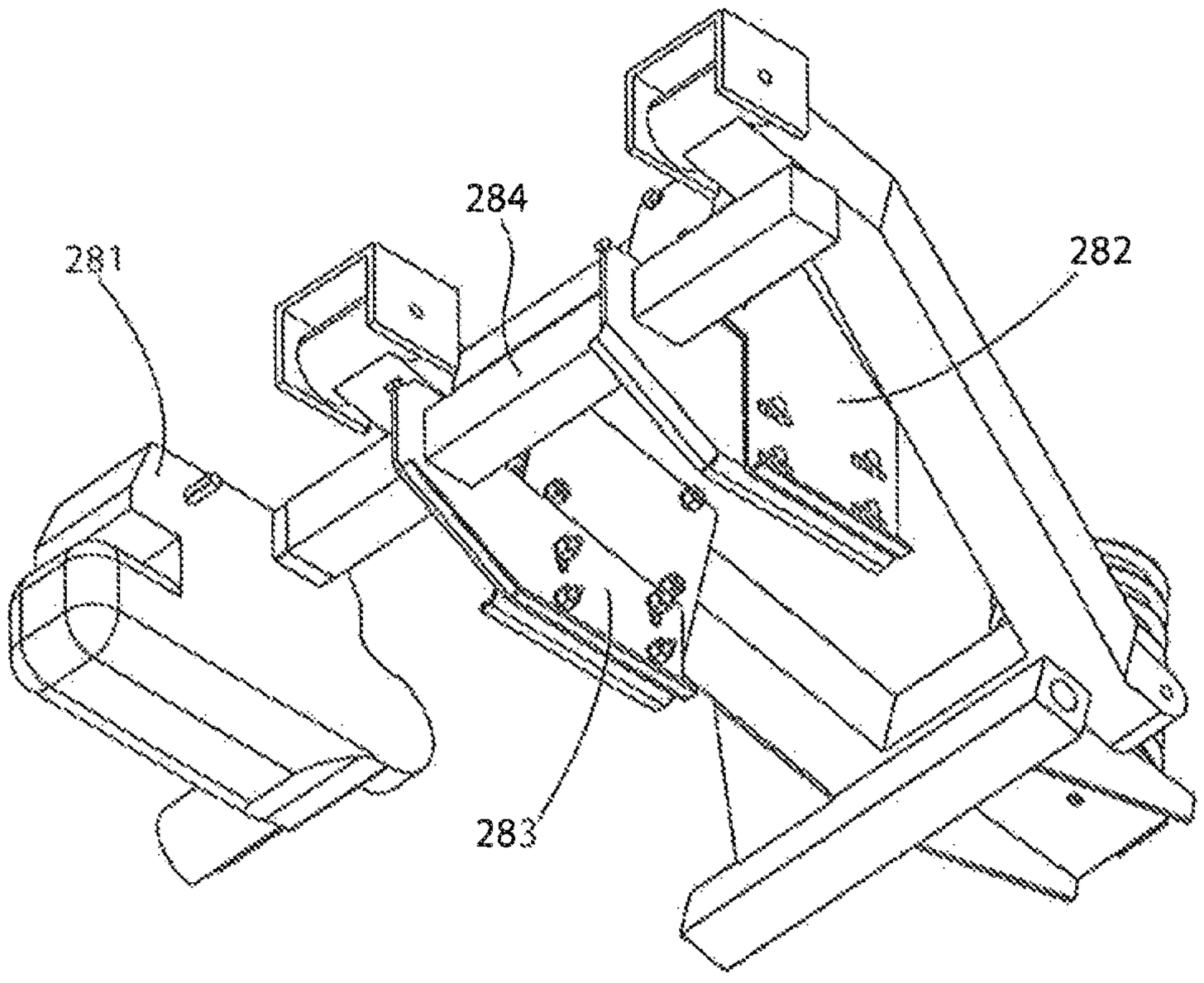

Figure 12

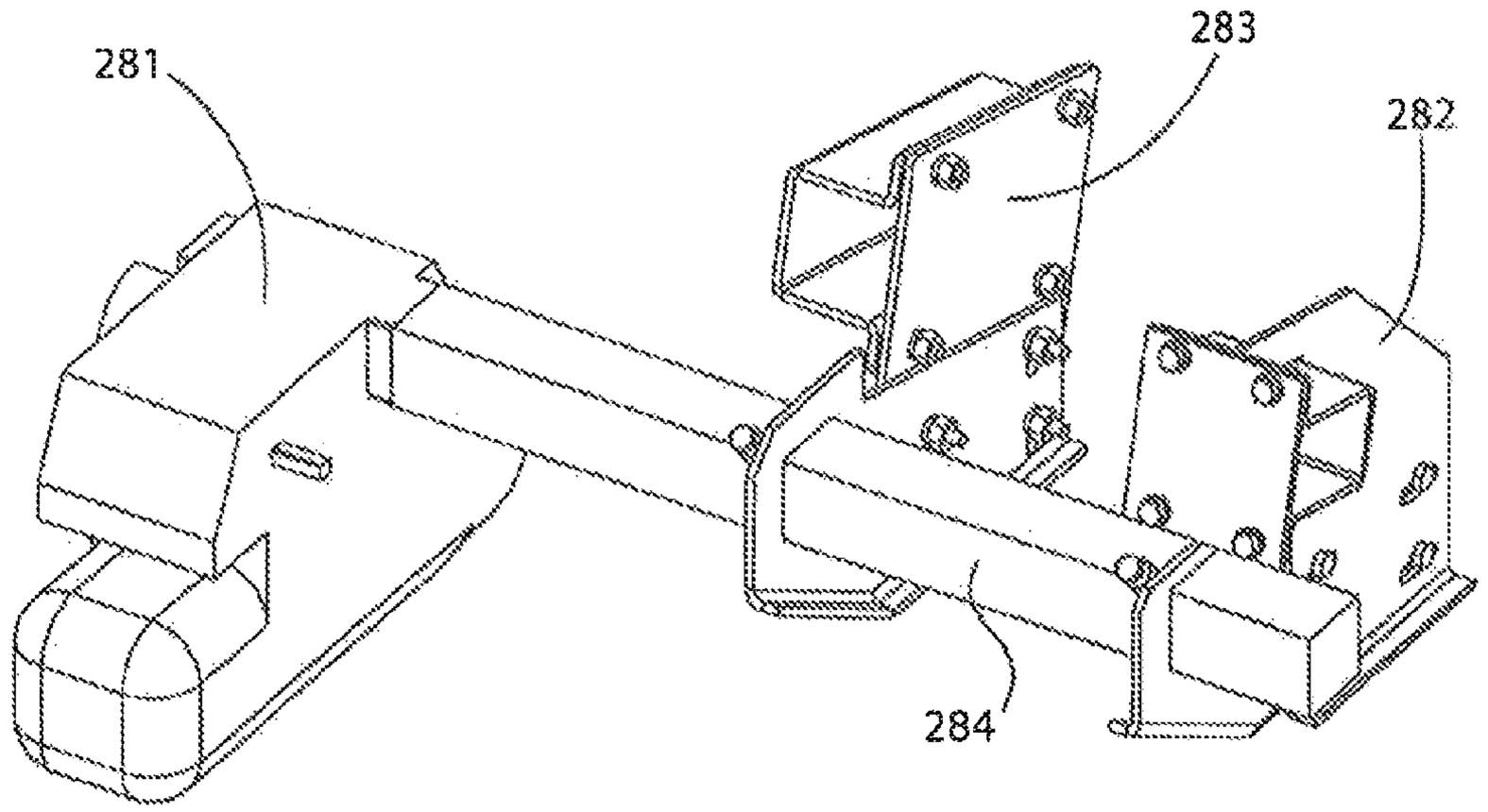

Figure 13

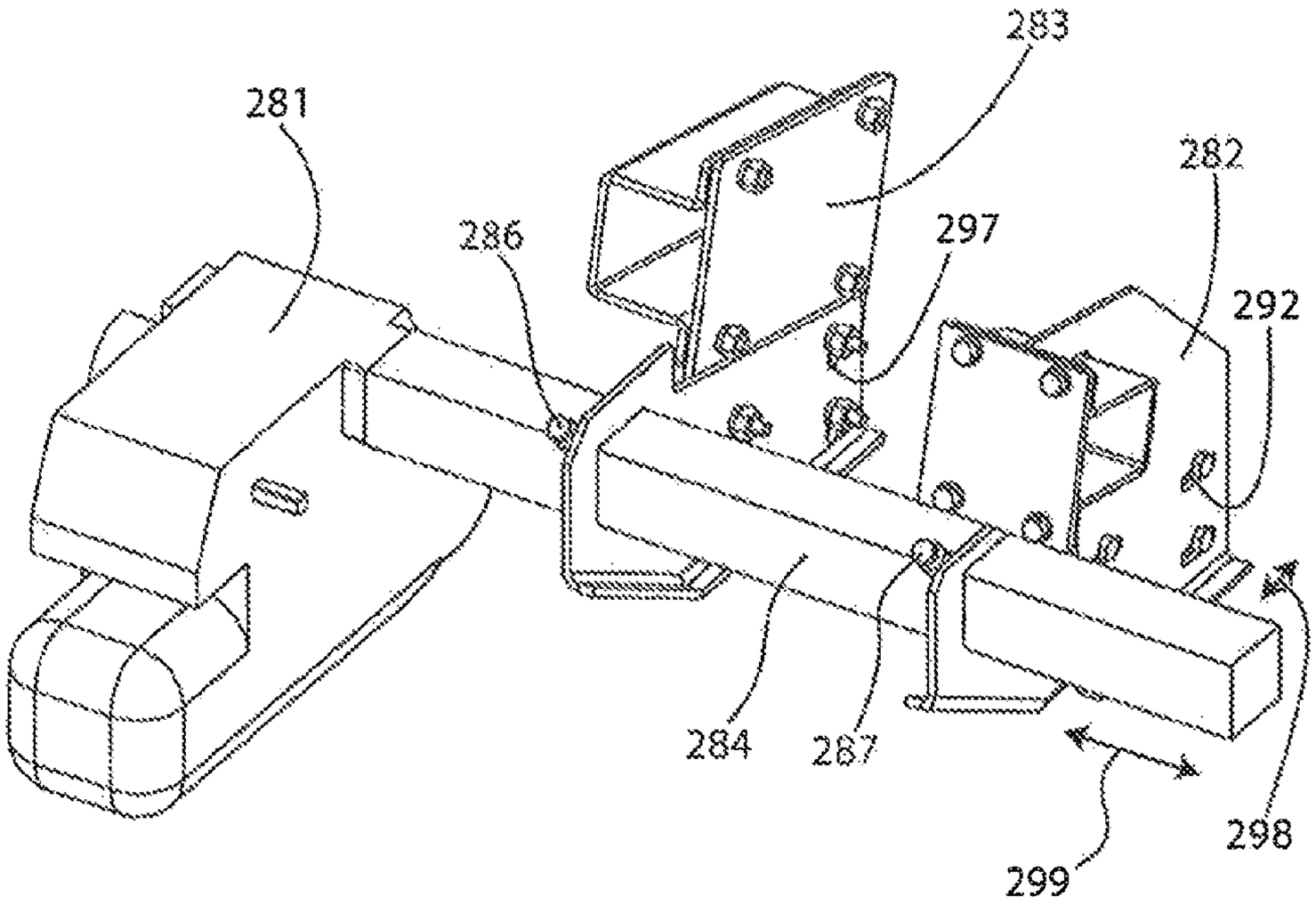

Figure 14

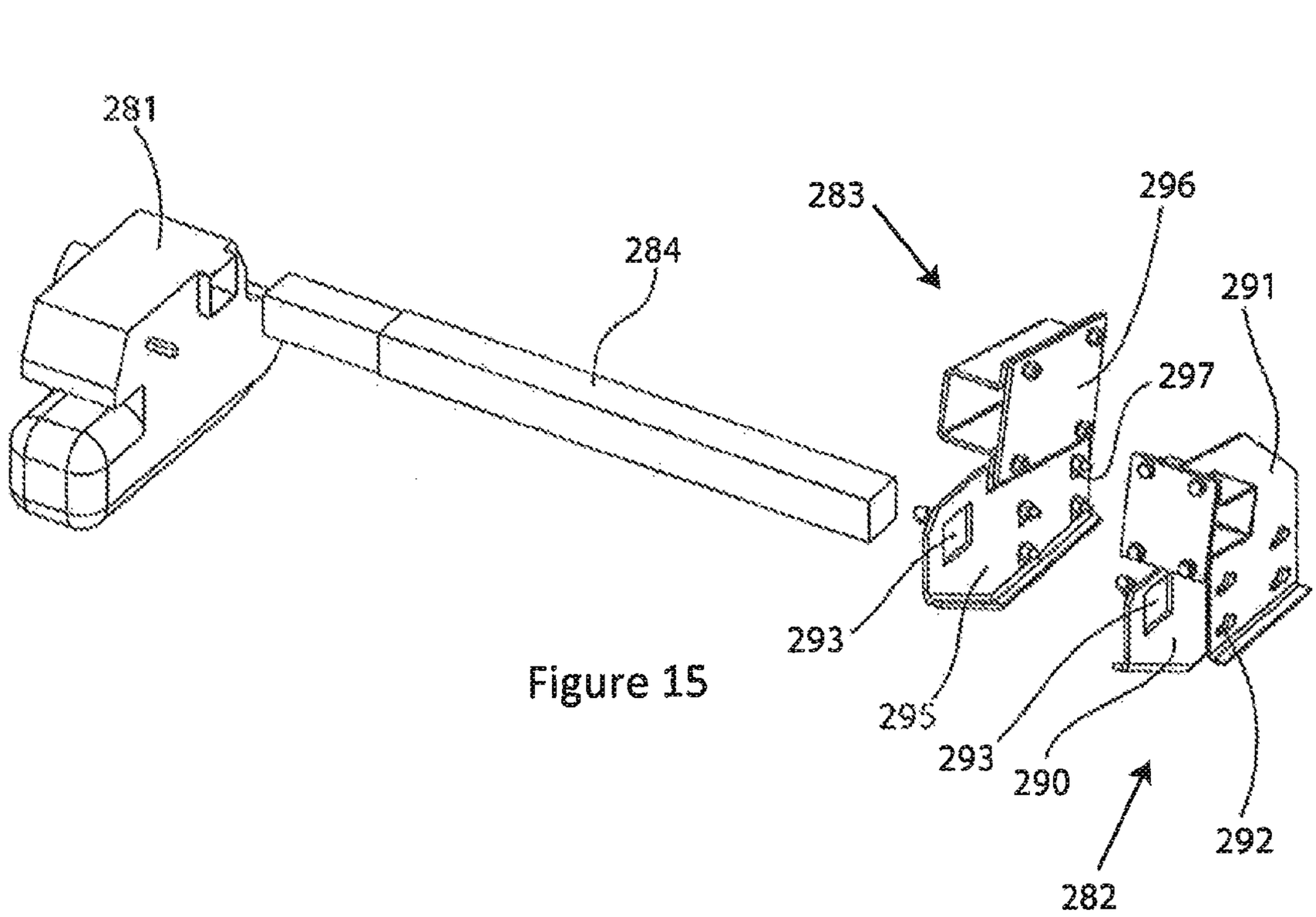

Figure 15

TRAILER MOVING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of priority of Australian patent application number 2014218438, filed 29 Aug. 2014, the contents of which are herein incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to a system for moving trailers without a vehicle. It is particularly suited for moving caravans and will be described in such a context, but is not to be limited to use with caravans as it is readily applicable to other types of trailers.

BACKGROUND TO THE INVENTION

It is often desirable to move trailers without the use of a vehicle, such as when storing a trailer or maneuvering the trailer into a confined space. This is easy to do manually when the trailer is small and unladen, but is burdensome for a large heavy trailer such as a caravan. This is particularly so for elderly caravan enthusiasts who form a high proportion of caravan users.

Caravan movers have been developed which consist of an electric motor which drives a roller. The mover is attached to the chassis of the caravan and when being used, moved into position such that the roller engages a wheel of the caravan and is thus able to provide motive force to the caravan to propel it short distances. For larger caravans it is common to fit a mover to both a left hand and a right hand wheel of the caravan. When not in use the mover is disengaged from the wheel and in some instances removed from the caravan. A mover will typically include a mechanism to easily engage and disengage the wheel, typically operated by a lever or a jack handle.

Known caravan movers are effective in most situations, however as the movers are fixed to the chassis of the caravan and the wheels of a caravan are mounted via a suspension system, the mover and the wheels can move independently of each other.

The mover may unexpectedly disengage from a wheel when there is a large movement in the suspension. Moving a caravan over a kerb or a pot-hole is often sufficient to disengage a mover from a wheel. If such disengagement is transitory the caravan may move in an uncontrolled and dangerous manner. If the disengagement is permanent the user would need to adjust the mover into position again to continue moving the caravan.

A large movement in the suspension may also bring the mover closer to the wheel. If this movement is excessive, undue force is applied to the mover which may permanently damage the mover.

The object of this invention is to provide a trailer mover that operates in a fixed relation to the wheels of a trailer to alleviate the above problems, or at least provides the public with a useful alternative.

SUMMARY OF THE INVENTION

In a first aspect the invention comprises a support assembly for holding a trailer mover in a fixed spatial relationship with a wheel of a trailer, said trailer including suspension with sprung components, wherein the support assembly is

attached to the sprung components of the suspension. Sprung component may include the axle carrier of a motor vehicle, including the axle supporting the wheels, a spring support plate of an independent suspension, a frame of an independent suspension, components of a motor vehicle that carry a suspension system, or the like. The suspension or suspension system may include at least one suspension spring. The at least one suspension spring may include but not limited to leaf springs, coil springs, suspension variants with shocks or rubber indespension units and the like.

Preferably the support assembly comprises a first member to provide longitudinal displacement of the trailer mover relative to the wheel, and a second member to provide lateral displacement of the trailer mover relative to the wheel.

Preferably the first member is adjustable to vary the longitudinal displacement of the trailer mover relative to the wheel and the second member is adjustable to vary the lateral displacement of the trailer mover relative to the wheel.

The suspension may include an axle, and the support assembly is attached to the axle.

The suspension may be and independent suspension including a spring support plate with the support assembly attached to the spring support plate, or the suspension may include a frame with the support assembly attached to the frame.

It should be noted that any one of the aspects mentioned above may include any of the features of any of the other aspects mentioned above and may include any of the features of any of the embodiments described below as appropriate.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred features, embodiments and variations of the invention may be discerned from the following Detailed Description which provides sufficient information for those skilled in the art to perform the invention. The Detailed Description is not to be regarded as limiting the scope of the preceding Summary of the Invention in any way. The Detailed Description will make reference to a number of drawings as follows.

FIG. **1** shows the chassis of a trailer with non-independent suspension fitted with four instances of the trailer moving system according to a first embodiment of the present invention.

FIG. **2** is a view of the invention as per FIG. **1** with the chassis removed to better illustrate the invention.

FIG. **3**A is a close up view of rear left hand instance of a trailer mover support assembly of the invention according to a first embodiment of the invention shown in a first position.

FIG. **3**B shows the trailer mover support assembly of FIG. **3**B in a second position.

FIG. **4** provides a further view of the support assembly of the first embodiment with various components removed to allow others to be seen in full.

FIG. **5** shows a trailer chassis with independent suspension fitted with trailer mover support assemblies according to a second and third embodiment of the invention.

FIG. **6** shows the chassis of FIG. **5** viewed from below.

FIG. **7** shows a first isolated view of the rear left trailer mover support assembly according to a second embodiment of the invention fitted to a suspension unit.

FIG. **8**A provides a second view point of FIG. **7** with the trailer mover support assembly in a first position.

FIG. **8**B shows the trailer mover support assembly of FIG. **8**A adjusted to a second position.

FIG. **9** shows an exploded view of the rear left trailer mover support assembly of FIG. **7** in isolation.

FIG. **10** shows a front right trailer mover support assembly according to a third embodiment of the invention fitted to a suspension unit seen from a first viewpoint.

FIG. **11** shows the support assembly of FIG. **10** from a second viewpoint.

FIG. **12** shows the support assembly of FIG. **10** from a third view point.

FIG. **13** is an isolated view of the trailer mover support assembly of FIG. **10** in a first position.

FIG. **14** shows the trailer mover support assembly of FIG. **13** adjusted to a second position.

FIG. **15** shows an exploded view of the third embodiment of the trailer mover support assembly.

The various elements of the drawings are identified as follows:

LIST OF COMPONENTS	
20	chassis with non-independent suspension
21	chassis frame
22	front axle
23	rear axle
30, 32, 34, 36	wheels
40	(left rear) trailer mover fixed support assembly
41	trailer mover
42, 44	longitudinal member
43, 45	axle attachment bracket
46, 48	longitudinal extension
47, 49	transverse attachment bracket
50	transverse member
51	mover support bracket
54	mover mount
55, 56	longitudinal locks
58	longitudinal adjustment
59	transverse adjustment
60	(right rear) trailer mover support assembly
61	trailer mover
70	(left front) trailer mover support assembly
71	trailer mover
80	(right front) trailer mover support assembly
81	trailer mover
120	chassis with independent suspension
121	chassis frame
130, 132, 134, 136	wheels
140	(left rear) trailer mover independent support assembly
141	trailer mover
142	fixed longitudinal bracket
143	sliding longitudinal bracket
144, 145	longitudinal adjustment slots
146	transverse locks
150	transverse guide
151	mover support bracket
153	transverse member
154	mover attachment
158	longitudinal adjustment
159	transverse adjustment
160	rear left suspension unit
161, 162	suspension mounts
163, 164	suspension arms
166	spring support
167	spring
168	axle support\
180	(right rear) trailer mover independent support assembly
181	trailer mover
190	rear right suspension unit
210	front left suspension unit
240	(left front) trailer mover independent support assembly
241	trailer mover
260	front right suspension
263	outer suspension arm
265	cross member

-continued

LIST OF COMPONENTS	
280	(right front) trailer mover independent support assembly
281	trailer mover
282	inner mounting bracket
283	outer mounting bracket
284	mover support
286, 287	transverse locks
290	first inner sub-bracket
291	second inner sub-bracket
292	adjustment slots
293	bracket apertures
295	first outer sub-bracket
296	second outer sub-bracket
297	adjustment slots
298	longitudinal adjustment
299	transverse adjustment

DETAILED DESCRIPTION OF THE INVENTION

The following detailed description of the invention refers to the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings and the following description to refer to the same and like parts. Dimensions of certain parts shown in the drawings may have been modified and/or exaggerated for the purposes of clarity or illustration.

The present invention provides a means of supporting a trailer mover in a fixed relationship to the wheels of a trailer. This ensures that the mover stays in contact with the wheel as the suspension of the trailer moves as will happen as the trailer wheels encounter a bump or a ditch. Trailer movers can be mounted both fore and aft of wheels and the trailers may have independent or non-independent suspensions. Such variations have necessitated multiple embodiment of the invention, all of which maintain a trailer mover in a fixed relationship to a wheel. The invention will be described first for non-independent suspension; then for independent suspension where the trailer mover is mounted aft of the wheels; and finally for independent suspension where the trailer mover is mounted before the wheels. Further embodiments of the invention cater for differences between left hand and right hand wheels; however as these embodiments are merely mirror images of other embodiments they will not be discussed in any detail.

A trailer chassis with non-independent suspension **20** is shown in FIG. **1** fitted with a first embodiment **40** of the invention supporting trailer mover **41** in fixed relation to the rear left hand wheel **30**. The chassis **20** comprises a frame **21** on which front axle **22** and rear axle **23** are mounted via leaf springs.

In FIG. **2** the chassis frame and springs are hidden to reveal the invention and its attachment to the axles. The support assembly **40** is attached to the rear axle **23** and holds mover **41** in relationship with a proximal wheel-the rear left hand wheel **30** in FIG. **2**. It should be understood that when using the term "support assembly" in any of its embodiments, that the same term may be understood to be a "support member." It should also be understood that the components of the support assembly/support member that provide the longitudinal displacement or positioning may be referred to as a "first member" or portion thereof. Similarly, all the components that provide lateral displacement or positioning may be referred to as "second member" or a portion thereof. Also on the rear axle is a further embodi-

ment of the support assembly **60** holding mover **61** in relationship with the rear right hand wheel **32**. The support assembly **60** is simply a mirror image of the support assembly **40**. The arrangement on the rear axle is mirrored on the front axle **22**, with and support assembly **70** holding mover **71** in relationship with the front left hand wheel **34**, and support assembly **80** holding mover **81** in relationship with the front right hand wheel **36**.

An isolated view of the support assembly **40** can be seen in FIGS. **3**A in which the mover **41** and the wheel have **30** have also been removed. The support assembly **40** may include longitudinal members **42** and **44** which are connected to the rear axle **23** by axle attachment brackets **43** and **45**. Longitudinal extensions **46** and **48** telescopically engage the longitudinal members to provide longitudinal adjustment of the transverse member **50**, also known. The extensions are locked in place by longitudinal locks **55**, **56** which comprise a threaded body that allows a screw to pass through to engage the extensions. Grub screws may alternatively be used. The brackets **47** and **49** attaching the transverse member may be loosened to allow for transverse adjustment. A mover support bracket **51** is attached to the end of the transverse member and provides a mount **54** for engaging the trailer mover **41**.

FIG. **3**B demonstrates the adjustment of the support assembly **40** with respect to FIG. **3**A with the longitudinal adjustment being indicated by arrow **58** and the lateral adjustment by arrow **59**. The longitudinal extensions **46**, **48** have been extended relative to FIG. **3**A and the transverse member **50** moved to the left. With the adjustments **58** and **59** it is possible to locate the mover support **51** and hence the mover so that it may come in contact with the wheel **30**. This makes the support assembly suitable for use on various trailers and with different wheel diameters and widths. The mover support **51** may also be interchanged with different sized variants to cater for differing wheel geometries.

FIG. **4** provides a further view of the support assembly **40** with various components removed to allow others to be seen in full.

A trailer chassis with independent suspension **120** is shown in FIG. **5** and includes second and third embodiments of the invention and further mirror image embodiments. The chassis **120** comprises a frame **121** to which are attached independent suspension units **160**, **190**, **210** and **260**. The rear left hand wheel **130** is engaged by trailer mover **141** which is held in position by the support assembly **140** which attaches to the suspension unit **160**. Support assembly **180** mounted to suspension unit **190** is a mirror image of assembly **140** and holds mover **181** in position with rear right hand wheel **132**. Similarly the front wheels **134** and **136** have associated movers **241** and **281** held by support assemblies **240** and **280** mounted to suspension units **210** and **260**. The front right support assembly **240** is a third embodiment of the invention and support assembly **280** is its mirror image. FIG. **6** provides a view of the chassis **120** from below allowing further features of the support assemblies to be discerned.

FIG. **7** provides a first isolated view of the rear left support assembly **140** fitted to the suspension unit **160** shown from a first side. Similar views from a second side are seen in FIGS. **8**A and **8**B. The suspension unit **160** comprises arms **163** and **164** attached at a first end of the chassis via pivot mounts **161** and **162**. The free end of the arms hold axle support **168** and spring **167** on spring support **166**. A fixed longitudinal bracket **142** of the support assembly **140** is attached to the spring support **166** by fasteners (not shown). A sliding longitudinal bracket **143** telescopically engages the fixed longitudinal bracket and provides longitudinal adjustment to the support assembly as indicated by arrow **158**. The sliding bracket supports transverse guide **150** which telescopically engages mover support bracket **151** to provide transverse adjustment as indicated by arrow **159**. FIG. **8**B shows the mover support bracket displaced relative to the FIG. **8**B, thus providing positional adjustment of the trailer mover **141**.

An exploded view of the support assembly **140** is shown in FIG. **9** in which further details can be discerned, including mover attachment **154** for mounting the trailer mover **141**; longitudinal adjustment slots **144** and **145** which allow movement of the sliding bracket **144** with respect to the fixed bracket **142**; and, transverse locks **146** for locking the mover support to the transverse guide **150**.

A front right support assembly **280** can be seen from various perspectives in FIGS. **10** to **12**. The support assembly **280** attaches to the suspension unit **260** differently to the how the support assembly **140** attaches to the suspension unit **160** as the trailer mover **281** sits fore of the wheel **136** (as opposed to the trailer mover **141** which sits behind the wheel **130**). The support assembly **280** attaches to the suspension unit **260** via tow brackets, outer mounting bracket **283** which attaches to the outer suspension arm **263** and inner mounting bracket **282** which attaches to the cross member **265** of the suspension unit. The brackets **282** and **283** in turn slidably support mover support **284** on which the trailer mover **281** is mounted.

Further details of the front right support assembly **280** can be seen in FIGS. **13** to **15** in which the support assembly is seen in isolation from the suspension unit. The brackets **282** and **283** are each made from three components pieces held together with nuts and bolts. Bracket **291** includes elongate adjustment slots **292** in adjacent components to provide longitudinal adjustment **298**. Bracket **283** includes elongate slots **297** that allow vertical adjustment of the component parts with respect to each other which in turn allows the bracket **283** to move along the outer suspension arm **263** resulting in longitudinal adjustment **298**. Lateral adjustment of the trailer mover **181** is provided by mover support slots **293** in the brackets. The mover support is held in the desired position by transverse locks **286** and **287**.

The embodiments described above all allow for adjustment of the support assembly to cater for various wheel and suspension geometries. The invention further includes embodiments without these adjustments (not shown) to cater for specific trailer geometries. The choice of whether to produce adjustable or non-adjustable embodiments is an economic decision dictated by the number of trailers of a specific geometry to be fitted with trailer movers.

The reader will now appreciate the present invention which provides a means of supporting a trailer mover in a fixed relationship to the wheels of a trailer with embodiments handling both independent and non-independent suspension; movers mounted either before or aft the wheels; and, movers mounted on either left hand or right hand wheels. Adjustable components provide longitudinal and lateral adjustment of the position of the trailer mover to allow for different wheel and suspension geometries.

Further advantages and improvements may very well be made to the present invention without deviating from its scope. Although the invention has been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made there from within the scope and spirit of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to

embrace any and all equivalent devices and apparatus. Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of the common general knowledge in this field.

In the present specification and claims (if any), the word "comprising" and its derivatives including "comprises" and "comprise" include each of the stated integers but does not exclude the inclusion of one or more further integers.

In one aspect of the present invention, a support assembly includes a support member connected to a sprung component of a trailer; and a trailer mover attached to said support member, wherein said trailer mover is operable to selectively engage with a proximal wheel of the trailer in a fixed spatial relationship, whereby the sprung component resiliently supports a chassis of the trailer via at least one suspension spring.

In another aspect of the present invention, the support member further includes a first member, wherein the first member is connected to the sprung component, and wherein the first member is adapted to provide longitudinal displacement of the trailer mover relative to the wheel; and a second member, wherein the second member is attached to the trailer mover, and wherein the second member is adapted to provide lateral displacement of the trailer mover relative to the wheel. The first member may be adjustable to vary the longitudinal displacement of the trailer mover relative to the wheel, wherein the second member may be adjustable to vary the lateral displacement of the trailer mover relative to the wheel, wherein the sprung component may include an axle supporting the wheel of the trailer, wherein the sprung component may include a spring support plate of an independent suspension unit associated with the wheel of the trailer, and wherein the sprung component comprises a frame of an independent suspension unit associated with the wheel of the trailer.

What is claimed is:

1. A support assembly, comprising:

a support member connected to a sprung component of a trailer;

a trailer mover attached to said support member, wherein said trailer mover selectively engages with a proximal wheel of the trailer in a fixed spatial relationship;

a first member, wherein the first member is connected to the sprung component, and wherein the first member is adapted to provide longitudinal displacement of the trailer mover relative to the wheel; and

a second member, wherein the second member is attached to the trailer mover, and wherein the second member is adapted to provide lateral displacement of the trailer mover relative to the wheel,

whereby the sprung component resiliently supports a chassis of the trailer via at least one suspension spring.

2. The support assembly of claim **1**, wherein the first member is adjustable to vary the longitudinal displacement of the trailer mover relative to the wheel.

3. The support assembly of claim **1**, wherein the second member is adjustable to vary the lateral displacement of the trailer mover relative to the wheel.

4. The support assembly of claim **1**, wherein the sprung component comprises an axle supporting the wheel of the trailer.

5. The support assembly of claim **1**, wherein the sprung component comprises an axle supporting the wheel of the trailer.

6. The support assembly of claim **2**, wherein the sprung component comprises an axle supporting the wheel of the trailer.

7. The support assembly of claim **3**, wherein the sprung component comprises an axle supporting the wheel of the trailer.

8. The support assembly of claim **1**, wherein the sprung component comprises a spring support plate of an independent suspension unit associated with the wheel of the trailer.

9. The support assembly of claim **1**, wherein the sprung component comprises a spring support plate of an independent suspension unit associated with the wheel of the trailer.

10. The support assembly of claim **2**, wherein the sprung component comprises a spring support plate of an independent suspension unit associated with the wheel of the trailer.

11. The support assembly of claim **3**, wherein the sprung component comprises a spring support plate of an independent suspension unit associated with the wheel of the trailer.

12. The support assembly of claim **1**, wherein the sprung component comprises a frame of an independent suspension unit associated with the wheel of the trailer.

13. The support assembly of claim **1**, wherein the sprung component comprises a frame of an independent suspension unit associated with the wheel of the trailer.

14. The support assembly of claim **2**, wherein the sprung component comprises a frame of an independent suspension unit associated with the wheel of the trailer.

15. The support assembly of claim **3**, wherein the sprung component comprises a frame of an independent suspension unit associated with the wheel of the trailer.

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